

Current distribution of the genus *Xenopus* in Africa and future prospects

par

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With 2 figures and 3 maps

ABSTRACT

The geographical distribution of the eighteen species and subspecies of the genus *Xenopus* is brought up to date. Nine new taxa may be portended and their location shown. The geographical pattern of these species is discussed.

INTRODUCTION

The former distribution by species is completely revised as a result of an examination of living specimens and of specimens preserved in several museums. A list of the localities where the specimens of each species were captured is given in a first part. The corresponding numbers are entered on three maps. When accompanied by an asterisk, it means that the specimens have been observed and come from the museum indicated. The numbers themselves merely refer to published works.

AMNH: American Museum Natural History. New York. N-Y. (USA).

FMNH: Field Museum of Natural History. Chicago. Illinois. (USA).

MCZ: Museum of Comparative Zoology. Cambridge. Massachusetts. (USA).

MHNG: Museum of Natural History. Geneva. (Switzerland).

MHNP: National Museum of Natural History. Paris. (France).

MZUM: Museum Zoology University Michigan. Michigan. (USA).

NMR: National Museum of South Rhodesia. Umtali. (Rhodesia).

NMW: Naturhistorisches Museum Wien. Wien. (Austria).

TM: Transvaal Museum. Pretoria. (South Africa).

ZFMK: Zoologisches Forshunginstitut Museum Koenig. Bonn. (D).

ZMUC: Zoologisk Museum Universitetparken. Kobenhavn. (Denmark).

* Muséum d'Histoire naturelle, case postale 343, CH-1211 Genève 6, Switzerland.

ZSMH: Zoologische Staatssammlung. München. (D).

U. Biology. Geneva: Station of experimental Zoology. prof. Fischberg.

The specimens of British Museum (London) and Royal Museum of Central Africa (Tervuren) have been investigated recently by Tinsley.

The second part deals with the geographical pattern by species of the genus *Xenopus*.

RESULTS

I. THE SPECIES *X. gilli* AND *X. laevis* (map 1)

a) *X. gilli*

- 1* Captown (South Africa). 1908. MHNP: 251.252., 1857. NMW: 6829., 1959. NMW: 13980., 1969. MHNG: unregistered.
2. Sylvermyn river near Captown (South Africa). ROSE & HEWITT, 1927.
3. Citrusdale, Calvinia near Captown (South Africa). POYNTON 1964.

b) *X. laevis laevis*

- 1* Kalkfeld (Namibia). 1979. ZFMK: 33110.
- 2* Okahantja, Windhok (Namibia). MCZ: 82193.
- 3* Delalande cap (South Africa). 1975. MHNP: 5045-5049. 8874. 1978-1996.
- 4* Mlanje (Malawi). AMNH: 35046.
- 5* South Malawi. 1975. U. Biology. Geneva. MHNG: unregistered.
- 6* Nchisi Mts (Malawi). MCZ: 27121-27125.
- 7* Namadzi (Malawi). 1960. ZMUC: R17660-R17670.

c) *X. laevis poweri*

1. National park of Upemba (Zaire). SCHMIDT & INGER 1959.
- 2* Barotseland (Zambia). 1964. NMR: 19456.
- 3* Kalabo, Barotseland (Zambia). NMR: 21157-21169.
- 4* Léalui District (Zambia). 1920. MHNP: 120.
- 5* Chunga, National park of Kafue (Zambia). 1974. NMR: 30072.
- 6* Chilanga (Zambia). 1963. NMR: 5297.
7. Lusaka (Zambia). POYNTON 1964.
- 8* Bilibili falls, Kalomo (Zambia). 1959. NMR: 3167. 18063. 18067-68.
- 9* some miles West Livingstone (Zambia). 1979. MHNP: 72-73. Dambwa, Livingstone (Zambia). NMR: 2644. Victoria falls, Livingstone (Zambia). LOVERIDGE 1957.
- 10* Lochinvar (Zambia). 1958. NMR: 2642.
11. Okavango marshs (Botswana). POYNTON 1964.
- 12* Ndobe, Ngamiland district (Botswana). 1921. TM: 30797-800.802.813.
- 13* Nokaneng (Botswana). TM: 30740-30753.
- 14* Sepopa, Ngamiland district (Botswana). TM: 30913-30915.30902.

MAP 1.

Records of *X. gilli* and *X. laevis* in Africa: *X. gilli*, ★, *X. l. laevis*, ■, *X. l. poweri*, □, *X. l. petersi*, ●, *X. l. victorianus*, △, *X. l. sudanensis*, *.
Numbers agree with the first part of the text.



d) *X. laevis petersi*

- 1* Lunda, tchifuka, Alto Cuilo (Angola). 1962. MCZ: 35899-35902.
2. Cuilo spring (Angola). LAURENT 1964.
- 3* Duque de Bragance (Angola). FMNH: 74183.
- 4* Gauca (Angola). FMNH: 21112-21118.
5. Dondo (Angola). du BOCAGE 1895., LOVERIDGE 1957.
6. Quibala (Angola). du BOCAGE 1895., LOVERIDGE 1957.
7. Cassongue (Angola). du BOCAGE 1895., LOVERIDGE 1957.
- 8* Chitau (Angola). FMNH: 21119-21122.
- 9* Katima Mulilo (Angola). TM: 43715.
- 10* Caconda (Angola). du BOCAGE 1895., LOVERIDGE 1957.
- 11* Catumbella (Angola). 1900. NMW: 6826.
- 12* Caimbambo (Angola). FMNH: 206426.
- 13* Coporolo rio (Angola). FMNH: 206424.206425.
14. Katengue (Angola). SCHMIDT & INGER 1959.
- 15* Ansre rio, Benguella (Angola). 1954. ZSMH: 25-54. 118-153.
- 16* Benguella (Angola). 1869. MHNP: 113. 113A.1465., du BOCAGE 1895. LOVERIDGE 1957.
- 17* Moçamedes (Angola). SZMH: 16/47., PARKER 1936.

e) *X. laevis victorianus*

- 1* Juba (South Sudan). FMNH: 58529.
- 2* Talanga forest, Katire (South Sudan). 1981. ZMUC: R17213-17222.
- 3* Imatong Mts, Katire (South Sudan). 1978. ZFMK: 29342.
- 4* Yei, Equatorial Province (South Sudan). 1938. MCZ: 23201-23203.
- 5* Uele district, National park Garamba (Zaire). FMNH: 160458.
- 6* Kitale (Kenya). 1974. MHNG: 1447.33-1447.40., U. Biology Geneva.
- 7* Kaimosi (Kenya). 1974. MHNG: 1447.41-1447.50., U. biology Geneva.
- 8* Kampala (Uganda). 1965. MHNG: unregistered., U. Biology Geneva.
- 9* Mubende (Uganda). 1972. MHNG: unregistered., U. Biology Geneva.
- 10* Fort-Portal (Uganda). 1972. MHNG: unregistered., U. Biology Geneva.
- 11* Kisiizi (Uganda). 1972. MHNG: unregistered., U. Biology Geneva.
- 12* Kitanga (Uganda). 1972. MHNG: unregistered., U. Biology Geneva.
- 13* Chelima forest (Uganda). 1975. MHNG: unregistered., U. Biology Geneva.
- 14* Shama (Rwanda). 1975. MHNG: unregistered., U. Biology Geneva.
- 15* lake Muhazy (Rwanda). 1975. MHNG: unregistered., U. Biology Geneva.
- 16* Mbuye (Rwanda). 1975. MHNG: unregistered., U. Biology Geneva.
- 17* Kigali (Rwanda). 1975. MHNG: unregistered., U. Biology Geneva.
- 18* Base (Rwanda). 1975. MHNG: unregistered., U. Biology Geneva.
- 19* Mukaka (Rwanda). 1975. MHNG: unregistered., U. Biology Geneva.
- 20* Katama, lake Kivu (Zaire). 1964. MHNP: 248.
- 21* Uvira, lake Tanganika (Zaire). 1964. MHNP: 251-254 (A-G).
- 22* Tukuyu, Rungive district (Tanzania). 1930. MCZ: 16312-16319.

f) *X. laevis sudanensis*

- 1* Rahama (Nigeria). 1982. Thiébaud mission. U. Biology Geneva.
- 2* Fuskam mata (Nigeria). 1982. Thiébaud mission. U. Biology Geneva.
- 2* Fuskam mata (Nigeria). 1982. Thiébaud mission. U. Biology Geneva.
- 3* Toro (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
- 4* Joss (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
- 5* Kassa (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
- 6* Poli Garoua (Cameroon). NMW: 6845.
7. Sadjé (Cameroon). PERRET 1966.

8. Bénoué plain (Cameroon). MHNG: 1017.74-1018.25. PERRET 1966.
9. Mbé, Ngaounyanga (Cameroon). MHNG: 1018.34. PERRET 1966.
10. Bangouvé (Cameroon). MHNG: 1055.60. PERRET 1966, MONARD 1951.
11. Adamaoua table-land (Cameroon). PERRET 1966.
12. Ngaoundéré (Cameroon). PERRET 1966.
13. Tibati (Cameroon). PERRET 1966.
- 14* Galim (Cameroon). KOBEL et al., 1980. U. Biology. Geneva.

II. THE SPECIES *X. muelleri*, *X. borealis* AND *X. clivii* (map 2)

a) *X. muelleri*

1. lake Ste Lucie (South Africa). POYNTON 1964.
- 2* Old Sangwali (Zwaziland). 1970. TM: 39219-39222.
Lubombo district (Zwaziland). TM: 52328.
- 3* Moamba (Moçambique). TM: 29642.29643.
- 4* Dzungwini water hole, National Park Krüger (South Africa) TM: 26377-26380.
- 5* Nuanetsi river, Majinji Pan (Rhodesia). 1961. FMNH: 187194-96.
- 6* Xhangha island (Ngamiland). 1923. TM: 44819.428255.
7. Okavango marshs (Botswana). POYNTON 1964.
- 8* Tete, Boroma mission (Moçambique). 1949. MCZ: 27140-27142.
9. Port-Herald (Malawi). LOVERIDGE 1953.
- 10* Mpatamanga pass, near Chileka (Malawi). 1953. MCZ: 27852.
- 11* South Malawi. 1975. MHNG: unregistered. U. Biology. Geneva.
- 12* Mtimbuka (Malawi). 1949. MCZ: 27133-27134. TM: 35886.
- 13* Maclear cap, lake Malawi (Malawi). TM: 54542.
- 14* Salima (Malawi). 1949. MCZ: 27128-27130.
15. Chitala river. LOVERIDGE 1953.
- 16* Mkanda (Zambia). 1964. NMR: 931-940. 994.
- 17* Chipangali (Zambia). 1963. NMR: 231.34.43.47.50. 1155-58. 163.
- 18* Chikowa (Zambia). 1963. NMR: 629-746.
- 19* Kalichero (Zambia). 1963. NMR: 104.
- 20* Nyika table-land (Zambia). 1962. NMR: 220.
- 21* lake Mweru, Wantipa (Zambia). 1952. TM: 25531.
22. Kala (Tanzania). de WITTE 1952.
- 23* Moba (Zaire). 1936. MCZ: 21637-21638.
24. banks of lake Tanganika (Tanzania). de WITTE 1952.
- 25* Ujiji (Tanzania). 1939. MCZ: 25042-25046.
- 26* Masasi (Tanzania). 1936. NMW: 6841.
- 27* Ifakara (Tanzania). 1965. MHNG: unregistered. U. Biology Geneva.
- 28* Morogoro (Tanzania). 1965. MCZ: 51690-51692.
- 29* Mtandika (Tanzania). TM: 35886.
- 30* Kilosa (Tanzania). 1922. TM: 11946.11947. 12401.
- 31* Dar es Salaam (Tanzania). 1927. MCZ: 12383., NMW: 6833.6835.6838., BARBOUR & LOVERIDGE 1925.
- 32* Kingani. Bogamayo (Tanzania). 1898. NMW: 6823.34.36.37.48.
- 33* Zanzibar and Mafia islands (Tanzania). LOVERIDGE 1957., 1864. MHNP: 1053A-B., 1869. NMW: 6832., 1887. NMW: 6817.13158.
- 34* Tanga. Noigula (Tanzania). 1912. ZSMH: 300-312.
- 35* Shimba hills (Kenya). 1974. MHNG: 1447.52-1447.55.
- 36* Mombasa (Kenya). 1974. MHNG: 1447.51.
- 37* Kipalapala, Tabora (Tanzania). 1964. MHNP: 9921-9969.
- 38* Grumeti river (Tanzania). AMNH: 59394.
- 39* Rawana river (Tanzania). 1911. ZSMH: 481.

- 40* Isiro (Zaire). 1982. Thiébaud mission. U. Biology Geneva.
 41* Poko (Zaire). 1981. ZFMK: 34375.
 42* Niangara (Zaire). 1913. AMNH: 9486.
 43* Ndelele, Akawa, Beredwa, National park Garamba (Zaire). 1959. FMNH: 195670.
 160070.160184.160247-160250. 160401-160424. 160706-160715.
 44* Nagero, Uele district (Zaire). FMNH: 160959-160-964.



MAP 2.

Records of *X. species* stretching in an arc outside the other species:
X. muelleri, ●, *X. borealis*, ○, and *X. clivii*, *.
 Numbers agree with the first part of the text.

- 45* Faradge (Zaire). 1912. MCZ: 6609.
 46* Yei, Equatorial Province (South Sudan). 1938. MCZ: 23202-23205.
 47. Gondokoro (South Sudan). LOVERIDGE 1957.
 48* Bachikélé water hole, Ennedi (Chad). 1966. MHNP: 1148-1210.
 49* Aoué water hole, Ennedi (Chad). 1966. MHNP: 1125-1134.
 50* Toura water hole, Ennedi (Chad). 1966. MHNP: 1136-1147.
 51* Fort Archambault (Chad). 1904. MHNP: 236.
 52* Garoua Boulai (Cameroon). MHNG: 1018.26., NMW:6845., PERRET 1966. Mbé, Duru (Cameroon). MHNG: 1018.27-1018.3., PERRET 1966.
 53. north and center savanna in Cameroon. PERRET 1966., SCHIÖTZ 1964. Mokolo (North Cameroon). MHNG: 213.40.
 54. Tibati, Bangouvé (Cameroon). MONARD 1951, PERRET 1966.
 55* Apawa (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 56* Yola (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 57* Bénoué plain (Cameroon). MONARD 1951, PERRET 1966. Bangouvé (Cameroon). MHNG: 1055.59., MONARD 1951. Ngaouyanga (Cameroon). MHNG: 1224.37-1224.41., PERRET 1966.
 58* Song (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 59* Little Gombi (Nigeria). 1976. ZFMK: 19475.
 60* Minchika (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 61* Madagli (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 62* Mayo Louti reserve (Cameroon). 1964. MHNP: 143-145.
 63* Arum (Nigeria). 1961. ZMU: R17166-17167.
 64* Kassa (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 65* Riyom plate-land (Nigeria). 1961. ZMU: R1797.1798.
 66* Joss (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 67* Toro (Nigeria). 1982.
 68* Fuskam mata (Nigeria). 1982.
 69* Rahala (Nigeria). 1982.
 70* Kano (Nigeria). 1945. ZMU: R174.175.
 71* Chafe (Nigeria). 1976. ZFMK: 19468-19474.
 72* Zaria (Nigeria). FMNH: 152243-152245. lake Kubani, Zaria (Nigeria). MHNG: 2080.4.
 73* Kaduna (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 74* Kachia (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 75* Luma (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 76* Kaiama (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 77* Sabe (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 78* Iseyin (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
 79* Igbetti (Nigeria). 1961. ZMU: R1724-1732. R131-133. R17238. R1786-1792. R17165.
 80* Oyo (Nigeria). 1961. ZMU: R143-156. R1777-1785. MHNG: 1018.32.33.
 81* Ibadan (Nigeria). 1961. ZMU: R17161.17162. R1768-1770. R1776. R1796. R1754-1757.
 82* Ago-Iwoje (Nigeria). 1961. ZMU: R1769-1775.
 83* Agouagou (Benin). 1919. MHNP: 79.
 84* along the coast in Ghana. 1980. MHNG: unregistered. U. Biology. Geneva.
 85* Bolgatang (Ghana). 1963. ZMU: R17293. 17294.
 86* Banfora (Upper Volta). ARNOULT & LAMOTTE 1968.
 87* Yako (Upper Volta). ARNOULT & LAMOTTE 1968.

b) **X. borealis**

- 1* Endebes, Elgon Mt (Kenya). 1974. MHNG: 1448.63-1448.86., PARKER 1936.
 2* Kitale (Kenya). 1935. MHNP: 157.157A.158., 1974. MHNG: 1447.99.100 1448.43-1448.48.
 3* Tambach (Kenya). 1974. MHNG: 1448.51-1448.62.

- 4* Malo (Kenya). 1974. MHNG: 1448.49-1448.50.
5. lake Nakuru (Kenya). PARKER 1936.
- 6* Sergoï (Kenya). 1935. MHNP: 156. 156A.
- 7* lake Naivasha (Kenya). 1904. MHNP: 383-386 (A-E), ANGEL 1925, PARKER 1936.
- 8* Kinagop plate-land (Kenya). 1935. MHNP: 155. 155A.
- 9* East Highlands near Limuru (Kenya). FMNH: 17041-173043.
- 10* Nairobi, Kiambu (Kenya). 1972. MHNG: unregistered. U. Biology Geneva.
Nairobi, Kikuyu Mts (Kenya). 1906. NMW: 6847.6842., MOCQUARD 1902.
Nairobi (Kenya). 1924. MHNP: 57., 1937. MHNP: 159-160., 1974. MHNG: 1447.56-1447.82. 1449.1-1449.5. 1513.51. 1566.41-1566.44. PARKER 1936, BOULENGER 1905., LOVERIDGE 1925.
Moriyo, Loita Hills, S.W. Nairobi. 1974. MHNG: 1574.46-1574.49. Athi river. 1974. MHNG: 1574.38-1574.54.
- 11* Watamu (Kenya). 1980. ZFMK: 32741-32742. (difficult determination).
- 12* Soronera, Serengeti (Tanzania). 1974. MHNG: 2056.96-98-99; sympatric with *X. muel-leri* MHNG: 2056.97 (Kreulen coll.).
- 13* Kavirondo bay (Kenya). 1924. MHNP: 56.
- 14* Nyeri (Kenya). 1972. MHNG: unregistered, U. Biology. Geneva.
- 15* Nanyuki (Kenya). 1974. MHNG: 1448.1-1448.12. 1449.4.
- 16* Meru, Kenya Mt (Kenya). 1957. ZMUC: R1733-1734. R1741-1742.
- 17* Thomson's falls near Nakuru. Laikipia (Kenya). 1974. MHNG: 1447.83-1447.97.
Laikipia ranch, Mukutan spring (Kenya). 1974. MHNG: 1448.87-62.
- 18* Rumuruti (Kenya). 1972. MHNG: unregistered., U. Biology. Geneva.
- 19* Samburu range (Kenya). 1972. MHNG: unregistered., U. Biology. Geneva.
- 20* Maralal (Kenya). 1972. MHNG: unregistered., U. Biology. Geneva.
- 21* Marsabit (Kenya). 1972. MHNG: unregistered., U. Biology. Geneva., PARKER 1936.

c) *X. clivii*

- 1* Saganeti, Adi Caien, Erythrea (Ethiopia). 1901. NMW: 13161., 1906. NMW: 6882., Peracca, 1898.
2. Addis Ababa (Ethiopia). Boulenger, 1905., Parker, 1930.
- 3* 40 km from Addis Ababa (Ethiopia). 1973. U. Biology. Geneva.
- 4* lake Zywai (Ethiopia). 1965. MCZ: 51457.

III. THE SPECIES *X. ruwenzoriensis*, *X. wittei* AND *X. vestitus* (map 3)

a) *X. ruwenzoriensis*

- 1* Semliki river, Bundibugyo (Uganda). 1975. Fischberg mission. U. Biology. Geneva., MHNG: unregistered.

b) *X. wittei*

1. Kassongwere (Zaire). TINSLEY *et al.* 1979.
2. Tshiaberimu river, Kianzohu (Zaire). TINSLEY *et al.* 1979.
3. Kanyabayongo (Zaire). TINSLEY *et al.* 1979.
4. Pinga (Zaire). TINSLEY *et al.* 1979.
5. lakes Mokoto: Ndalaga, Rukuru, Bitu, Ngesho. (Zaire). TINSLEY *et al.* 1979.
6. Burunga (Zaire). TINSLEY *et al.* 1979.
7. Bishakishaki (Zaire). TINSLEY *et al.* 1979.
8. Kashwa (Zaire). TINSLEY *et al.* 1979.
9. Kitondo, Gandjo (Zaire). TINSLEY *et al.* 1979.

10. lake Magera (Zaire). TINSLEY *et al.* 1979.
11. impenetrable forest, Kigesi (Uganda). TINSLEY *et al.* 1979.
- 12* Chelima forest (Uganda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 13* lake Mulehe (Uganda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 14* Butongo (Uganda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 15* Echuya forest (Uganda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 16* Kyabahinga, lake Bunyoni (Uganda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 17* Kashasha, lake Bunyoni (Uganda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 18* lake Cyahafi (Uganda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 19* lake Bulera (Rwanda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 20* lake Luondo (Rwanda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 21* Mukaka (Rwanda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 22* Mugambazi (Rwanda). 1975. Fischberg mission. MHNG: unregistered, U. Biology. Geneva., TINSLEY *et al.* 1979.
- 23* Musosa (Zambia). TINSLEY *et al.* 1979.

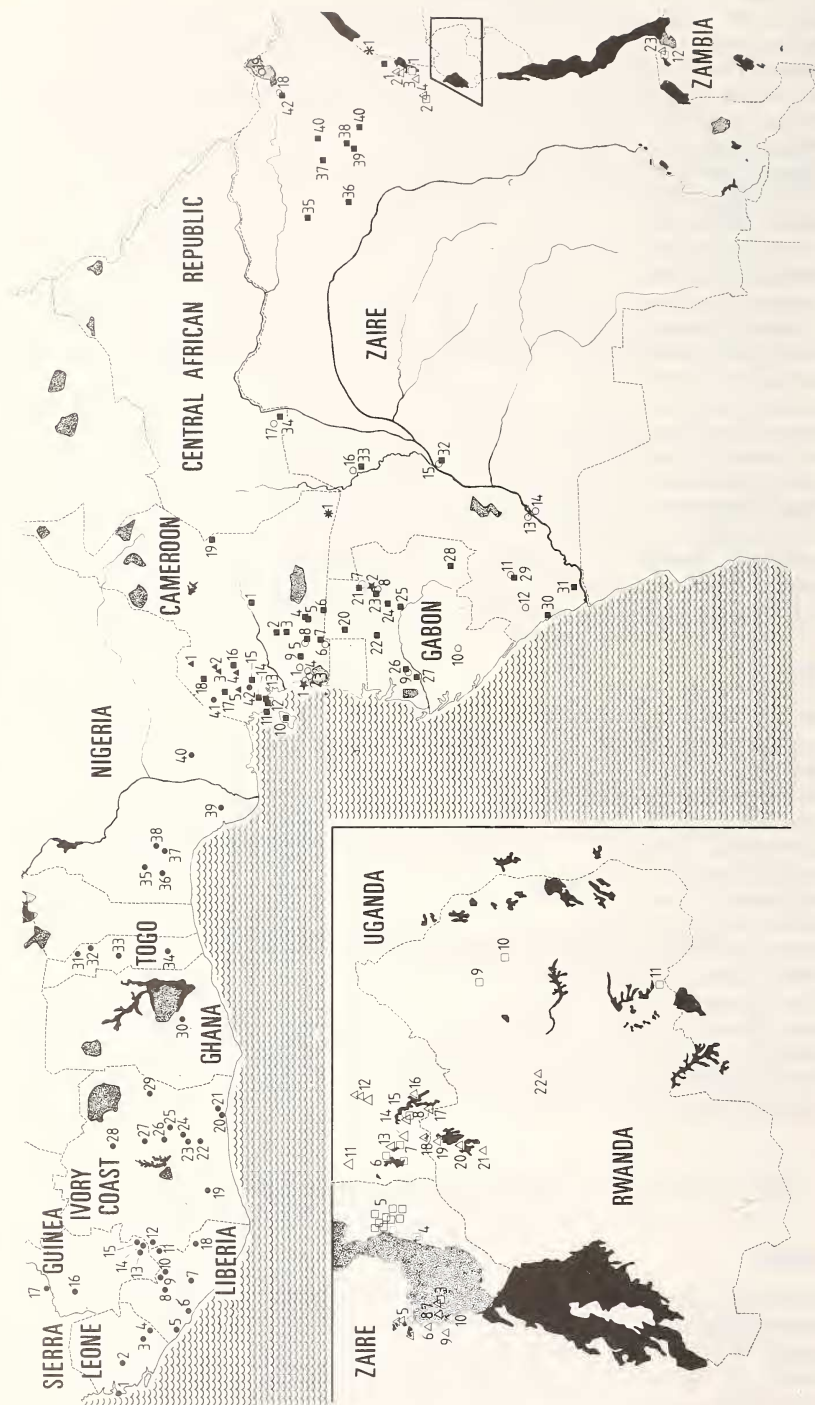
c) **X. vestitus**

1. Kamande, lake Amin Dada (Zaire). TINSLEY 1975.
2. Pinga, lake Kivu (Zaire). TINSLEY 1975.
3. Bishakishaki river, Kamatembe (Zaire). TINSLEY 1975.
4. Rumangabo (Zaire). LAURENT 1972.
5. Kasha, Rutshuru, Bukengeri and Kantundwe rivers (Zaire). TINSLEY 1975.
6. lake Mutanda (Uganda). 1975. Fischberg mission. MHNG: unregistered., U. Biology. Geneva., TINSLEY 1973, 1975.
7. lake Mulehe (Uganda). 1975. Fischberg mission. MHNG: unregistered., U. Biology. Geneva., TINSLEY 1973, 1975.
- 8* Echuya forest (Uganda). 1975. Fischberg mission. MHNG: unregistered., U. Biology. Geneva., TINSLEY 1973, 1975.
9. Gabiro (Rwanda). TINSLEY 1975.
- 10* Shama (Rwanda). 1975. Fischberg mission. MHNG: unregistered., U. Biology. Geneva.
- 11* Mbuye (Rwanda). 1975. Fischberg mission. MHNG: unregistered., U. Biology. Geneva.
12. Musosa (Zambia). TINSLEY 1975.

IV. THE SPECIES **X. tropicalis** AND **X. epitropicalis** (map 3)

a) **X. tropicalis**

- Diattacounda, Casamanca (South Senegal). 1975. ZMFK: 16816-16843.
- 1* Freetown (Sierra Leone). 1963. MHNP: 1366.
 - 2* Kassewe (Sierra Leone). FMNH: 109739.
 - 3* Njala (Sierra Leone). 1979. Tymowska mission. Uni. Biology Geneva.
 - 4* Potoru (Sierra Leone). FMHN: 121951.



MAP 3.

Records of equatorial and sub-tropical *X. species*: *X. vestitus*, □, *X. wittei*, △, *X. ruwensoriensis*, *, *X. bumbaensis*, *, *X. fraseri-like*, ■, *X. andrei*, ★, *X. amieti*, ▲, *X. tropicalis*, ● and *X. epirotropicalis*, ○. Numbers agree with the first part of the text.

- 5* St Paul river, Paiata (Liberia). 1926. MCZ: 11869-11871.
Gbang, Paiata (Liberia). BARBOUR & LOVERIDGE 1930.
- 6* Harbel (Liberia). FMHN: 123952.
- 7* Frank (Liberia). 1896. MHNP: 280-285.
- 8* Suococo, Central Province (Liberia). AMNH: 83576.
- 9* Gbanga (Liberia). 1926. MCZ: 11861. 11866. 11867.
- 10* Ganta (Liberia). 1937. MCZ: 22416.22417.
- 11* Sangbui (Liberia). 1920. MHNP: 181-185.
- 12* Nimba Mt (Guinea). 1946. MHNP: 943A-948A. FMNH: 57908., 1951. MHNP: 248., 1956. MHNP: 1335-1345.
- 13* between Nzo and Doraman (Guinea). 1944. MHNP: 162A.H-164A.G., 1956. MHNP: 1350. on the road of Lola (Guinea). 1961. MHNP: 1352.
- 14* Ziela (Guinea). 1956. MHNP: 1355.1356., 1970. MHNP: 636-639.
- 15* Zoogepo (Guinea). 1957. MHNP: 1353.
- 16* Gouela (Guinea). 1957. MHNP: 1351.
- 17* Kouroussa (Guinea). 1904. MHNP: 446-449.
- 18* Zwedru (Liberia). AMNH: 83577.83578.
- 19* Niapoyo forest, Soubré (Ivory Coast). 1962. MHNP: 1225-1229.
- 20* Abidjan (Ivory Coast). 1960. MHNP: 1223.1224.
- 21* Adiopodoumé (Ivory Coast). 1965. Uni. Biology Geneva., 1970. MHNG: 1056.38-1056.58. 1189-22-1189.34. 1580.93-1580.97.
- 22* Kotiessou, Lamto (Ivory Coast). 1962. MHNP: 1261-1311.1314.1316.1318.1319.1321. 1330-1334.
- 23* Kpakobo (Ivory Coast). 1963. MHNP: 1320., LAMOTTE 1967.
- 24* Orumbo-Boka (Ivory Coast). 1963. MHNP: 1235-1242.
- 25* Assakra (Ivory Coast). 1963. MHNP: 1242.1244.
- 26* Bandama, Lamto (Ivory Coast). 1963. MHNP: 1307.
- 27* Bouaké pond (Ivory Coast). 1962. MHNP: 1232.
- 28* Ngolodougou (Ivory Coast). 1957. ZFMK: 19467.
- 29* Toukoui pond (Ivory Coast). 1960. MHNP: 1230.1231.
- 30* Mamfe (Ghana). 1963. ZMU: R17247. R17240-17244.
- 31* Kandé (Togo). MHNP: 7079-7124.
- 32* Lama-Kara (Togo). 1974. MHNP: 7084. 7099.
- 33* Sotougoua (Togo). MHNP: 7098. 7099.
- 34* Niamtougou (Togo). MHNP: 7086-7129.
- 35* Oyo (Nigeria). FMNH: 173566. 173567.
- 36* Ibadan (Nigeria). 1961. ZMUC: R1763-1768. R17230. R17157-17160.
- 37* Ife (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
- 38* Iperin (Nigeria). 1961. ZMUC: R1793-R1795. R1194-1197. R1164. R1171-1174.
- 39* Ughelli (Nigeria). 1961. ZMUC: R17199. R17237.
- 40* Enuga (Nigeria). 1982. Thiébaud mission. U. Biology. Geneva.
- 41* Mamfe (Cameroon). MCZ: 20995-21000.
- 42* Manengolé, N'Kongsamba (Cameroon). 1959. MHNG: 1016.92.

b) *X. epitropicalis*

- 1* Bipindi (Cameroon). 1960. MHNG: 1016.93-95.
- 2* Longyi (Cameroon). Loumont, 1983. U. Biology. Geneva.
- 3* Efulen, Kribi (Cameroon). 1960. MHNG: 1016.96-1016.97.
- 4* Akok (Cameroon). LOUMONT 1983. U. Biology. Geneva.
- 5* Ebolowa (Cameroon). 1957. MHNP: 1256-1258., 1958. MHNG: 1224. 70-73. Asso'osseng, Ebolowa (Cameroon). 1957. MHNG: 954. 70-78.
- 6* Nkoemvone, Ebolowa (Cameroon). MHNG: 2013.42-2013.44., LOUMONT 1983., U. Biology. Geneva.
- 7* Belinga river (Gabon). 1964. MHNG: 2080.94-2080.98.

- 8* Makokou (Gabon). 1964. MHNG: unregistered (Knoepfler coll.), 1982. Thiébaud mission. U. Biology. Geneva.
- 9* St Croix des Echiras (Gabon). 1930. MHNP: A703.
- 10* Mouïla (Gabon). 1951. FMNH: 75057.
- 11* Sibiti (Zaire). 1963. MHNP: 348-354.
- 12* Dimonika (Zaire). 1964. MHNP: 355-366.
- 13* Brazzaville (Zaire). MHNP: 1259-1260.
- 14* Kinshassa (Zaire). FISCHBERG *et al.* 1983. U. Biology. Geneva.
- 15* Lukulela (Zaire). AMNH: 59361.
- 16* Sangha region (Zaire). 1925. MHNP: 1945.A8.
- 17* Lobaye, Bobua de Bokanga (Central African Republic). 1966. MHNP: 1251.
- 18* Dungu, Uele district (Zaire). FMNH: 160588.
- 19* Uele district, Garamba park (Zaire). FMNH: 160441-160443.

V. THE SPECIES *X. amieti*, *X. andrei* AND *X. boumbaensis* (map 3)

a) *X. amieti*

- 1* lake Oku (Cameroon). KOBEL *et al.* 1980. U. Biology. Geneva.
- 2* Galim (Cameroon). KOBEL *et al.* 1980. U. Biology. Geneva., MHNG: 2030.84-2030.83.
- 3* Mbouda (Cameroon). KOBEL *et al.* 1980. U. Biology. Geneva. MHNG: 2030.84-2030.83.
- 4* Waka (Cameroon). KOBEL *et al.* 1980. U. Biology. Geneva., MHNG: 2030.84-2030.83.
- 5* Manengouba Mt (Cameroon). KOBEL *et al.* 1980. U. Biology. Geneva., MHNG: 2030.80-2030.87.

b) *X. andrei*

- 1* Longyi (Cameroon) .MHNG: 2088.32. LOUMONT 1983. U. Biology. Geneva.
- 2* Makokou (Gabon). 1982. Thiébaud mission. U. Biology. Geneva.

c) *X. boumbaensis*

- 1* Wava, Moloundou (Cameroon). MHNG: 2088.31. LOUMONT 1983. U. Biol. Geneva.

VI. THE SPECIES *X. fraseri* (map 3)

a) *X. fraseri* from South West Cameroon.

- 1* Nanga Eboko (Cameroon). 1930. MHNP: 76-78.
- 2* Yaoundé (Cameroon). 1978. U. Biology. Geneva.
- 3* Mbalmayo, Ebamina (Cameroon). 1972. MHNG: 1555/91-93.
- 4* Sangmelima (Cameroon). FMNH: 19929-19932., NMW: 6856 (1-5).
Ekombite, Sangmelima (Cameroon). LOUMONT 1983. U. Biology Geneva.
- 5* Nkoemvone (Cameroon). Loumont, 1983. U. Biology. Geneva.
- 6* border of South Cameroon. MHNP: 1906.210.
- 7* Ambam (Cameroon). 1958. MHNP: 75-79.
- 8* Asso'osseng, Ebolowa (Cameroon). 1957. MHNG: 955.
- 9* Foulassi, Ebolowa (Cameroon). 1957. MHNG: 1017.2-1017.73. 955.2-955.20.

b) *X. fraseri* from Cameroon Mt and near coast

- 10. Fernando Poo (Guinea Equatorial). BOULENGER 1905.
- 11* Bibundi (Cameroon). 1958. ZMU: R17228. R17117-17122.
- 12* Bonianiango (Cameroon). 1981. Amiet coll. U. Biology. Yaoundé.

- 12* Bonianiango (Cameroon). 1981. Amiet coll. U. Biology. Yaoundé.
 13* Bolifemba (Cameroon). 1981. Amiet coll. U. Biology. Yaoundé.
 14* Kendonge (Cameroon). 1981. Amiet coll. U. Biology. Yaoundé.

c) **X. fraseri** from North West and North East Cameroon.

- 15* Manengolé, N'kongsamba (Cameroon). 1957. MHNG: 954.97-954.99., 1959. MHNG: 1016.98-1016.100.
 16* Bangwa (Cameroon). 1972. MHNG: 1224.74-88. 1555.86-90. 954.81-96. Bangwa (Cameroon). 1981. Loumont mission. U. Biology. Geneva. Foullassi, Bangwa (Cameroon). MHNG: 917.72-917.74.
 17* Fako, Kupe Mt (Cameroon). 1977. ZFMK: 19457. 19462.
 18* Bamenda (Cameroon). 1958. ZMUC: R17175. 17177. 17179. 17185. 17188. 17192. 17104. 17239. 17193.
 19* Garoua Boulai (Cameroon). 1960. MHNG: 1017.1.

d) **X. fraseri** from Gabon and Zaïre

- 20* Oyem (Gabon). 1965. MHNG: 2080.99-2080.100.
 21* Belinga (Gabon). 1975. MHNG: unregistered (Knoepfler coll.).
 22* (Gabon). MHNG: 1467.4-5. Grelert mission (Knoepfler coll.).
 23* Makokou (Gabon). MHNG: unregistered (Knoepfler coll.). 1982. Thiébaud mission. U. Biology. Geneva.
 24* Adoué (Gabon). 1964. MHNG: 2081. 23-2081.30.
 25* Chicago, Ivindo (Gabon). 1964. MHNG: 2081.1-2081.22.
 26* St Croic des Echiras (Gabon). 1930. MHNP: 704A.
 27* Lambaréné (Zaïre). 1901. MHNP: 597.598.
 28* Bordeaux (Gabon). 1964. MHNG: unregistered (Knoepfler coll.).
 29* Sibiti (Zaïre). 1964. MHNP: 367-369.
 30* Pointe-Noire (Zaïre). MHNP: 8525/1-47.
 31* Mayombé (Zaïre). Laurent, 1961.

e) **X. fraseri** from central Zaïre and Central African Republic

- 32* Lukoléla (Zaïre). AMNH: 59362. 59365.
 33* Sangha region (Zaïre). 1925. MHNP: 1945/8.B8.C8.
 34* Lobaye, Bobua de Bokanga (Central African Republic). 1966. MHNP: 1252.

f) **X. fraseri** from Est Zaïre.

- 35* Buta (Zaïre). 1936. MCZ: 21629-21631. 1982. Thiébaud mission. U. Biol. Geneva.
 36* Banalia (Zaïre). AMNH: 9790.
 37* Niapu (Zaïre). AMNH: 9649-9678.
 38* Ngayu (Zaïre). AMNH: 9764-9770.
 39* San Benito, Muni river (Zaïre). MHNP: 1885.465.
 40* Avakubi (Zaïre). AMHN: 9793-9801.
 41* Medge (Zaïre). AMHN: 9736-9765.
 42* Dungu (Zaïre). AMNH: 9783-9785.

VII. GEOGRAPHICAL PATTERN OF THE SPECIES *X. laevis* AND *X. gilli*

The species *X. laevis* covers an immense area; it consists of an eastern branch, the subspecies of which stretch from South Africa to Sudan (*X. l. laevis*, *X. l. poweri*, *X. l. victorianus*) and a very allopatric branch (*X. l. persi*, *X. l. sudanensis*).

a) *X. laevis laevis*

It is not known how far north this subspecies extends in South Africa, but it has been caught in Namibia. To the east it reaches the mountains of Malawi and is sympatric with *X. muelleri*.

The specimens from Malawi (Mlanje, Namadzi and Nchisi Mts) have similar morphological characters to the specimens from South Africa; the only difference is that the specimens from Mlanje have a highly pigmented ventral surface with a clear furrow in the center like *X. vestitus*. There are specimens resembling *X. l. laevis*, but flatter (Fischberg, personal communication) and with a slightly different mating call from *X. l. laevis*. How far does this population stretch?

b) *X. laevis poweri*

It is not known how far this subspecies extends to the north and west; in the south it is sympatric with *X. muelleri*.

c) *X. laevis petersi*

This subspecies is found in Angola. It is more often caught near the coast, its eastward extension is unknown.

In the Benguella hinterland (Coporolo, Caimbambo, Ansriver) there is a population different from *X. l. petersi*. As in *X. l. petersi* these specimens have very pronounced circum-orbital plaques giving the eye the appearance of a wheel; the dorsal markings are irregular, few in number on the back and upper hind limbs; the ventral surface is coloured, speckled on the upper hind limbs less so on the abdomen. On the other hand their metatarsal tubercle is quite prominent, just a little less than that of *X. muelleri*. Their tentacles are short but project clearly from the side on the head.

FMNH: 206424. 206425. 206426.

ZSMH: 118/53. 25 to 54.

Do these anatomical differences simply reflect local variations?

e) *X. laevis victorianus*

This subspecies occupies a strip stretching along the great African lakes, from lake Tanganika to Sudan. Several species are allopatric with *X. laevis victorianus*; its distribution is therefore clearly circumscribed: it is limited in Rwanda and Uganda by *X. vestitus* and *X. wittei*, at the western border of Kenya by *X. ruwenzoriensis* and *X. bo-realis*, in the Garamba park in Zaïre by *X. muelleri* and *X. epitropicalis*, and in Sudan by *X. muelleri*.

The mating calls of the specimens from Kenya, Uganda and Rwanda (Nos. 6 to 19) are identical.

The specimens from the Imatong Mts in Sudan may belong to a different population. Their heads are poorly preserved and this prevents a clear determination; but they appear different being darker and rougher-skinned than the other specimens.

f) *X. laevis sudanensis*

Geographically completely cut off from the other subspecies, *X. l. sudanensis* has been caught in the savanna of northern Cameroon and northern Nigeria. The southern

limit of its distribution seems to be defined, but the western limit is unknown. *X. muelleri* and *X. l. sudanensis* are sympatric.

The specimens from sites 2, 5, 12 and 14 have identical mating calls.

g) *X. gilli*

The species is dying out; its distribution area is extremely small. *X. gilli* and *X. l. laevis* are sympatric. Natural hybrids of these two species have been caught at the Cape (KOBEL 1981).

VIII. GEOGRAPHICAL PATTERN OF THE SPECIES *X. muelleri*,
X. borealis AND *X. clivii*

a) *X. muelleri*

Its extensive geographical distribution extends in an arc through East Africa; it stretches from South Africa via northern Tanzania to Upper Volta. This species is not found in Uganda, Rwanda and Kenya excepted about Mombassa. It extends to the West African savannas via eastern Zaïre.

It is allopatric in Tanzania. Some species are sympatric with *X. muelleri*: *X. l. poweri* in the Okavango Marshes, *X. l. laevis* in Malawi, *X. l. sudanensis* in Cameroon and Nigeria.

The dorsal phenotype, characterized by large rounded markings, is remarkably similar everywhere. However, some populations in Zimbabwe, Malawi and Zaïre display a different arrangement of the markings on the back. The markings are aligned in two parallel bands behind the eyes (Fig. 1). The type with parallel markings seems the most common in Zimbabwe, where only animals of this type are caught:

Chikowa (Zimbabwe)	109 sp. TM
Malipati river (Zimbabwe)	3 sp. FMNH
Sagayo (Tanzania)	1 sp. MCZ
Mpatamanga (Malawi)	1 sp. MCZ
Chitala river (Malawi)	1 sp. MCZ

The two types are found alongside each other in Zaïre:

Timbuka Mts (Malawi) MCZ	2 sp. parallel markings
	2 sp. scattered markings
Moba (Zaïre) MCZ	1 sp. parallel markings
	1 sp. scattered markings
Garamba (Zaïre) FMNH	4 sp. parallel markings
	37 sp. scattered markings

There is no morphological difference between these two types of specimens, even in the number of the ridges around the eyes.

The dorsal phenotype also has some special features in the desert population of Chad. In the Ennedi water-holes the specimens have a very large number of small irregular spots reminiscent of the *X. borealis* pattern. Compare this phenotype (Fig. 1b) with the normal phenotype (Fig. 1c). Admittedly the specimens from Chad are all small (2-4 cm), which could cause the concentration of the spots, but the *X. muelleri* specimens of the same size never display a phenotype of this kind.

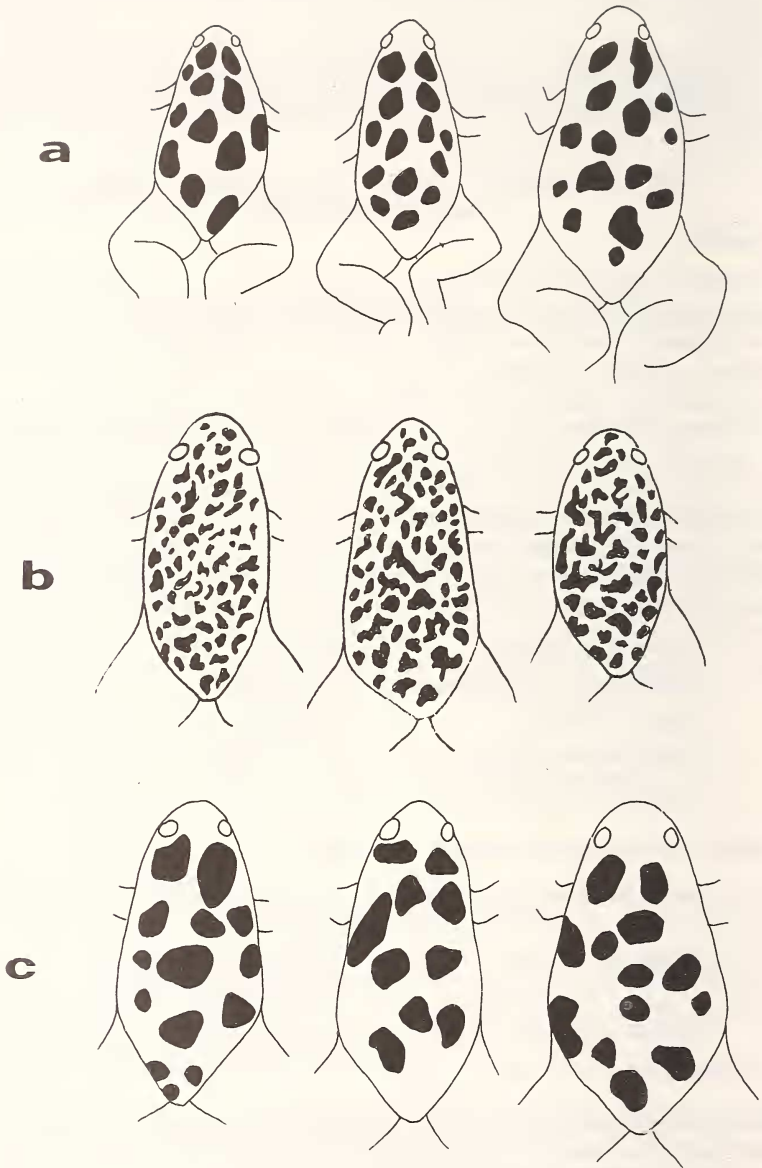


FIG. 1.

Range of dorsal phenotypes of *X. muelleri*. Parallel spots (a) Zambia. sp. length 30 to 80 mm; small spots (b) Chad. sp. length 25 to 30 mm; normal spots (c) Ifakara, Tanzania. sp. length 40 mm.

The type mating call of *X. muelleri* is nearly identical in the specimens from Malawi (No. 11), the coast of Ghana (No. 84) and Nigeria (Nos. 61, 68, 73, 74, 75, 77); the two types of mating calls are also heard (VIGNY 1977).

b) *X. borealis*

The limits of this species are now definitively known in Kenya. It is advancing further south in the Soronera Park (Kreulen, specimens and records). It is allopatric in the west with *X. l. victorianus* on Elgon Mt, in the south with *X. muelleri* in the Soronera park, and in the north with an as yet unidentified species around lake Turkana (Fischberg, personal communication).

The specimens from sites 1, 10 and 20 have identical matings calls.

c) *X. clivii*

Little is still known about its distribution; it has mainly been caught around Addis Ababa and on the north coast.

IX. GEOGRAPHICAL PATTERN OF *X. ruwenzoriensis*, *X. vestitus*
AND *X. wittei*

a) *X. ruwenzoriensis*

The distribution area of this species is at present unknown; it has been found at only one site.

b) *X. vestitus* and *X. wittei*

These are two sympatric species whose distribution is now well defined. They extend along the great African lakes to the east of Zaïre, in southern Uganda and Rwanda.

X. wittei and *X. l. victorianus* are sympatric in Rwanda.

X. l. bunyoniensis has disappeared from this region on account of volcanic upheavals (TINSLEY *et al.* 1979).

X. GEOGRAPHICAL PATTERN OF *X. tropicalis* AND *X. epitropicalis*

a) *X. tropicalis*

This forest species is allopatric over a now welldefined area from Senegal to northern Cameroon.

The mating calls are identical in the specimens from Sierra Leone (No. 3), Ivory Coast (No. 21) and Nigeria (Nos. 37, 40).

b) *X. epitropicalis*

Its geographical distribution is less well known. Common in southern Cameroon and Gabon (LOUMONT 1983), it does not seem to be present in northern or southern Zaïre, but it found in eastern Zaïre (Garamba park).

Other species are sympatric with *X. epitropicalis*: *X. fraseri* in Cameroon, *X. l. victorianus* and *X. muelleri* in the Garamba park. The mating calls are similar in the specimens from Longyi (No. 2), Akok (No. 4), Nkoemvone (No. 6), Kinshassa (No. 14) and Makokou (No. 8).

XI. GEOGRAPHICAL PATTERN OF THE SPECIES *X. amieti*,
X. andreï AND *X. boumbaensis*

a) *X. amieti*

This species is known to be present in only the Bamiléké country of western Cameroon. It is confined to these wet mountains or does it extend further east in Cameroon?

b) *X. andreï* and *X. boumbaensis*

The distribution of these two species is at present unknown. How far in Gabon does the coastal species *X. andreï* extend? Is *X. boumbaensis* spreading in the Central African Republic?

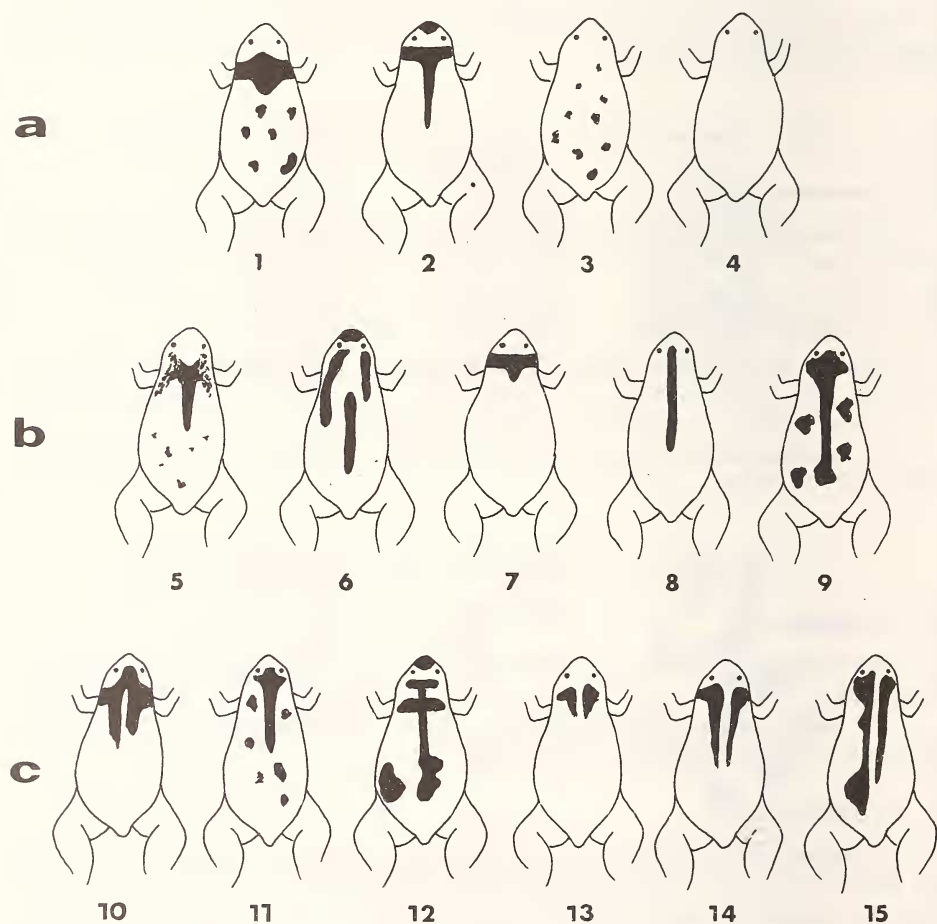


FIG. 2.

X. fraseri-like phenotypes usually observed. South Cameroon (a): Sangmelima 1.2.3.4; Foullassi 2.3. East Cameroon (b): Kupe Mt 5.6; Kendonge 6.7; Bonianiengo 7; Bolifemba 8.9. North-East Zaïre (c): the localities are enumerated in Table 1.

XII. GEOGRAPHICAL PATTERN OF THE SPECIES WITH THE
X. fraseri phenotype

The extend of the species *X. fraseri* needs to be reviewed since the discovery of cryptic species (LOUMONT 1983). Because research is still continuing, all the *X. fraseri*-like specimens are still presented as belonging to this species.

In the present the following facts have been established:

- a) A series of animals of the same species inhabit in the forests of South Cameroon: the *X. fraseri*. They have the same mating calls in Yaoundé (No. 2), Nkoemvone (No. 5), Sangmelima (No. 4) and Ebolowa (No. 9). It is probable that the specimens collected in 1960 by Perret (MHNG) at Efulen, upcountry from Kribi, belong to the coastal *X. andreï* species (This station is not shown on the map).
- b) Around Cameroon Mt, the animals live in streams of running water, instead of in pools or ponds as in the forest of South Cameroon. These specimens do not always have the back pattern which is typical of *X. fraseri* (Fig. 2b). Their belly and snout are closely spotted and darker as in *X. vestitus*. The morphometric characters presented in Table 1 show the greater differences with *X. fraseri* and *X. amieti* (KOBEL *et al.* 1980).
- Nothing at all is known about the population of Fernando Poo.
- c) In North Cameroon, uncertainty is complete. What species are found in Bangwa and in the eastern savannas at Garoula Boulai?
- d) In Gabon and Zaïre, I recognize *X. epitropicalis* and *X. andreï* at Makokou. The mating calls of these species (LOUMONT 1983) are the same as in Gabon; compare them

TABLE 1.

Morphometric characters of X. fraseri-like specimens from Kupe Mt. compared with those of X. fraseri and X. amieti.

Specimens from Nkoemvone (a), from Ekombite, Sangmelima (b), and from Ebolowa, MHNG (c).

	<i>X. fraseri</i> -like Kupe Mt	<i>X. fraseri</i> Yaoundé	<i>X. amieti</i> Manengouba
Number of lateral line plaques around the eyes	10,4 (9-13)	8,2+0,1	17,7+0,7
between eye and cloaca	18,3 (17-21)	19 +0,3	14,4+0,7
Indices, in percent of body length			
eye diameter	4,2 (3,7-4,6)	4,6+0,4	4,0+0,2
distance between eye centers	15,8 (14-17,4)	17,2+1,4	15,9+0,9
tentacles length	3,0 (2,7-3,8)	2,2(a) 2,5(b) 2,8(c)	(1,6-2,2)

TABLE 2.

Range of dorsal pattern on the *X. fraseri*-like specimens in Northern Zaïre (AMNH, MCZ). These phenotypes numbers agree with those in Fig. 2a, c.

	Number of specimens	Phenotypes					
		pattern like <i>X. fraseri</i>			(10)	new pattern	
		(1.2)	(3)	(4)	(10)	(11.12)	(13.14.15)
Niapu	178	62	34	8	3	29	42
Medje	26	14	5	—	—	—	7
Batenga	5	2	1	—	—	2	—
Ngayu	12	2	1	1	—	2	6
Dungu	5	1	1	—	1	2	—
Buta	3	1	1	—	—	—	1
Avakubi	14	1	3	—	—	7	3
Banalia	1	—	—	—	—	—	1

with the characteristics of the sonograms of *X. epitropicalis* (Makokou): duration of one call 0,14s (0,13-018); number of calls/min 204; number of notes/call 14,4 (14-17); number of notes/min 5838; and the sonograms of *X. andrei* (Makokou): 0,96s (0,5-1,8); numbers of calls/minute 42 (35-50); number of notes/call 155 (76-302); number of notes/minute 9600.

The species in eastern Zaïre have a dorsal phenotype different from the *X. fraseri* pattern and surely are a new taxon like in Kupe Mt. The specimens have a long patch starting between the eyes or two parallel, fairly long stripes behind the eyes (Fig. 2c). The pattern of back markings have been established in eight places in Zaïre (Table 2). It will be noted that the new phenotypes are present in all these places, the range being complete in Niapu. But the number of specimens is also greater there. It would be interesting to hear the mating calls of each type.

DISCUSSION

Each generic review provides fresh evidence of a geographical pattern of species.

The species *X. laevis*, the morphology of which is quite distinct from that of the other species of this genus, is at present the only one to be divided into sub-species. These four (or maybe seven) sub-species have a fertile F1, are distinctly allopatric, and their mating calls vary widely, so that there is a very pronounced vocal barrier.

X. gilli is a species; its F1 with *X. laevis laevis* is sterile (KOBEL 1981). The two species are sympatric but their genetic inheritance is still very similar (MÜLLER 1977). The isolation mechanism between *X. laevis laevis* and *X. gilli* is no complete, because there is an opportunity for the F1 to be fertile (KOBEL 1981).

The geographical pattern of species is also apparent in the distribution of the related species *X. muelleri*, *X. borealis* and *X. clivii*, which are found in a great arc

outside the area of *X. laevis*. Within its own enormous area, *X. muelleri* has no sub-species. This may be due to the fact that the savanna constitutes a somewhat uniform biotype. Differentiation occurs when geographical and climatic barriers create major gaps between populations. The auditory analysis of the *X. muelleri* mating calls are still identical in specimens from Malawi (No. 11), Tanzania (No. 27), Zaïre (No. 40) and Ghana (No. 84). But the population of *X. muelleri* in Rhodesia and Tibesti, with distinctive dorsal phenotypes, are perhaps isolated peripheral cases which are evolving into species.

Informations on the genus *Xenopus* continue to develop. A further nine taxa may be added to the eighteen species and sub-species at present recognised. The polyploid species, now increasingly numerous, appear to be related particularly closely to the biotype of the equatorial forest.

RÉSUMÉ

La répartition géographique des dix-huit espèces et sous-espèces du genre *Xenopus* est mise à jour. Neuf nouveaux taxa sont présentés et leur localisation est indiquée. La spéciation géographique de ce genre est discutée.

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